RARE

Regional Applied Research Effort

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Through the Regional Applied Research Effort (RARE) ORD responds to the high priority, near-term research needs of EPA's Regional Offices. Annually, each EPA Region submits a project to an ORD Laboratory /Center where it is processed as an extramural research activity. Joint participation by staff from both the Laboratory and the Regional Office throughout the development of the project and through completion of the research fosters communication and collaboration between ORD and the EPA Regional Offices.

Region 5: Development of Methods To Evaluate Critical Ecosystems

Defining and identifying areas that support ecosystems critical to the health of a region is an important but difficult task. Critical ecosystems are those that are fully functional and provide amenities and services that are necessary to sustainable human activities. Currently, these ecosystems are identified using best professional judgement, and this judgement is rarely verified through a variety of other methods.

The Critical Ecosystems Team in the US EPA's Region 5 has already used Geographic Information Systems (GIS) technology and best professional judgement to create a spatially explicit database of critical ecosystems in the region (see Figure 1). The Regional map was created by overlaying many different datasets that described ecological characteristics in three broad categories: diversity, sustainability and rarity. A resulting composite map indicates areas within Region 5 that support potentially critical ecosystems; those with high ecological diversity, many rare species, and an area large enough to be sustainable.

Figure 1. Critical ecosystems in USEPA Region 5.

Researchers at the ORD National Risk Management Research Laboratory will verify this map through two different methods. First, regional experts on ecosystems in Region 5 will develop and refine a rapid assessment technique that will gather data on these ecosystems from the field. They will first test this assessment method on at least 24 300m x 300m sites in the Chicago, Illinois area, and than at randomly selected sites throughout Region 5. This method will groundtruth the GIS composite map, and is expected to demonstrate a high correlation between data collected in the field by experts and the spatially explicit layers compiled from a variety of sources. The second method will use advances in Information Theory to assess both the GIS data and the field data for criticality in ecosystems. In particular, we will use the Fisher Information index that will be adapted to identify spatial changes in ecosystem characteristics (rather than temporal attributes, as has been used previously). Either verification method could stand alone, however, the combination of both field and theoretical methods to verify the GIS composite map will greatly enhance the utility of this map for Region 5.

The methodology proposed here, to identify critical ecosystems using several complimentary processes, will be transferrable to all other EPA Regions. All Regions are currently facing rapid urbanization, with loss of both agricultural and natural areas that once served to mitigate for urbanization effects (such as increased flood events, air pollution, etc.). Identifying the remaining critical ecosystems is important, as these areas will have a high conservation and management priority. The investigation of three different critical ecosystem identification methodologies will allow state and federal agencies greater flexibility in choosing which method is most feasible to use in their jurisdiction, and will result in greater reliability when more than one method is used. The emphasis on including local experts to develop field data collection techniques will insure that the types of data collected are appropriate for the Region and state natural resource trustee agencies.

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